

# Technology Opportunity

## Digital Channel Simulator

The National Aeronautics and Space Administration (NASA) Lewis Research Center seeks to form partnerships with industry to utilize and possibly commercialize a digital channel simulator.

### Potential Commercial Uses

- Real-time, modemless testing of encoder/decoder (codec) pairs
- Real-time addition of noise to digitally modulated data or other sampled waveforms
- Controlled noise generation

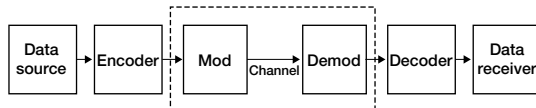
### Benefits

- Enables testing of codec pairs in a controlled environment—results are accurate and repeatable.
- Allows testing of codec pairs with a variety of modulation schemes and noise characteristics.
- Supports data rates up to 155 megasymbols per second (Mps) with symbol sizes up to 10 bits.

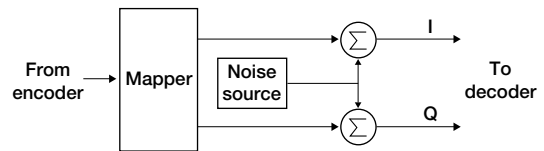
### The Technology

The Lewis-developed digital channel simulator is a real-time test set that simulates the characteristics of the modulator (mod), demodulator (demod), and transmission medium in a typical digital communications system to enable controlled laboratory testing of codec pairs.

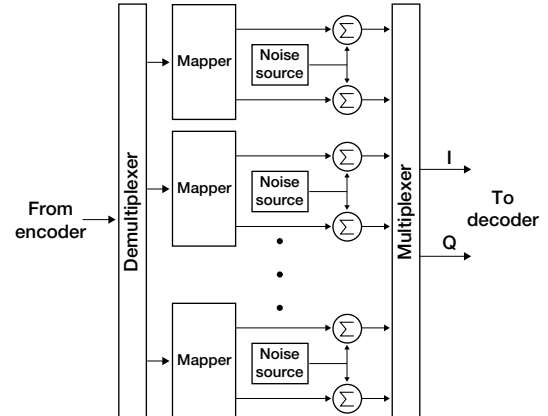
In a typical communications system, the modulator places a symbol in constellation space and puts it on a carrier to be sent to the demodulator. Because of noise on the channel, the I and Q position in constellation space cannot be recovered exactly, and the received coordinates shift.



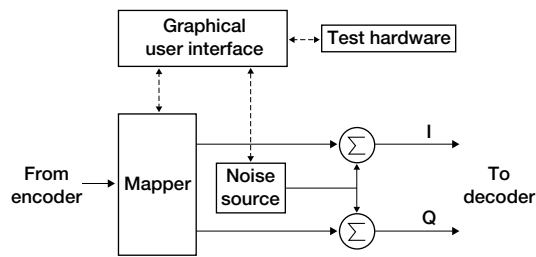
To mimic this process in the laboratory, the channel simulator uses the mapper to place the symbol in constellation space. It simulates the shift in coordinates by digitally adding “noise” to the I and Q values.



The mapper and noise source are implemented in look-up tables. Modulation schemes and noise characteristics are set by the values loaded in these tables. The mapper also has a pass-through mode to facilitate modulator testing, allowing noise to be added to modulated data without a second mapping.



tables. This interface can also be used to debug and verify proper operation of the channel simulator or to control an experiment.



## Options for Commercialization

Part of the mission of NASA's Space Communications Program is to help the commercial communications industry maintain world leadership. In support of this effort, Lewis hopes to form partnerships with industry to utilize, and possibly commercialize, the digital channel simulator.

## Contacts

Thomas P. Bizon, Electronics Engineer  
Communications Technology Division  
NASA Lewis Research Center  
Mail Stop 54-8  
21000 Brookpark Road  
Cleveland, OH 44135  
Phone: (216) 433-8121  
E-mail: [tbizon@lerc.nasa.gov](mailto:tbizon@lerc.nasa.gov)

Lawrence A. Nagy, Electronics Engineer  
Communications Technology Division  
NASA Lewis Research Center  
Mail Stop 54-8  
21000 Brookpark Road.  
Cleveland, OH 44135  
Phone: (216) 433-3453  
E-mail: [lawrence.nagy@lerc.nasa.gov](mailto:lawrence.nagy@lerc.nasa.gov)

## Key Words

Channel simulator  
Codec test set  
Modem eliminator



National Aeronautics and  
Space Administration  
Lewis Research Center